

## MP3 APPLICATION DEVICE

### CROSS-REFERENCE TO RELATED APPLICATION

5           This application claims the priority benefit of Taiwan application serial no. 92119225, filed July 15, 2003.

### BACKGROUND OF THE INVENTION

#### Field of the Invention

10   [0001] The present invention relates to an MP3 playing device. More particularly, the present invention relates to an MP3 application device capable of playing music by reading MP3 code data stored inside a portable disk or a memory card without a computer or an MP3 audio system.

#### Description of the Related Art

15   [0002] With rapid advance in personal computer technologies and networking interfaces, downloading music in various digital format such as MP3 (MPEG layer 3) MIDI (Musical Instrument Digital Interface), WAV and WMA is quite common. After downloading, the music is played through a computer. In fact, WAV and WMA are Window software catered for the audio frequency format. With recent legalization of MP3 data  
20   downloading, more people choose to download MP3 audio files due to their higher sound quality, small data volume and ease of acquisition. Furthermore, as the prices of portable disks fall, more people choose to hold MP3 song data in portable disks so that to exchange MP3 data with friends easily.

[0003] In general, people can listen to MP3 songs at home by switching on a computer and inside a car if an MP3 decoder system is installed. If the purpose of switching the computer on is to listen to MP3 songs, both power and computer resources are wasted. Moreover, the computer needs time to perform a list of tests before the operating system is ready. On the other hand, listening to MP3 music inside a car requires installation of an MP3 system instead of a CD audio system. In other words, MP3 users have to spend a sum of money to replace the ordinary CD system with an MP3 system before they can play their favorite MP3 songs burned on a CD inside their car.

[0004] In brief, MP3 songs can be listened to at home by turning the computer on and inside a car by installing a CD system with an MP3 decoder. Yet, solely listening to MP3 music via the computer is a heavy waste of energy and installing an MP3 decoder in a car is a burden to the user.

#### SUMMARY OF THE INVENTION

[0005] Accordingly, one object of the present invention is to provide an application device for MP3 such that MP3 data stored in a Universal Serial Bus (USB) device or a memory card can be directly played on a loudspeaker without a computer.

[0006] A second object of this invention is to provide an application device for MP3 that utilizes the standard frequency modulation (FM) stereo-audio system within a car to play MP3 audio data inside a USB device or a memory card.

[0007] To achieve these and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, the invention provides an application device for playing MP3 music. The application device is connected to a USB device or a

memory card so that MP3 code data stored within the USB device or the memory card can be played. The MP3 application device further comprises a loudspeaker, a host interface module and a playing module.

[0008] According to one preferred embodiment of this invention, the host interface  
5 module comprises a universal serial bus (USB) host circuit and a card host circuit. The USB host circuit is an interface for communicating with the USB device. The card host circuit is an interface for communicating with the memory card when a memory card is plugged into the MP3 application device.

[0009] According to the preferred embodiment of this invention, the playing module  
10 actively issues a fetch instruction via the host interface module and then reads the MP3 code data from the USB device. The playing module comprises an MP3 decoder, a buffer unit and a host unit. The buffer unit is a place for holding the MP3 code data temporarily. The MP3 decoder converts the MP3 code data within the buffer unit into voice data and then outputs the voice data. The host unit is a controller for controlling the host interface  
15 module, the buffer unit and the MP3 decoder.

[0010] According to one preferred embodiment of this invention, the loudspeaker receives and broadcasts the voice data.

[0011] This invention also provides an MP3 application device. The MP3 application device can be used to play MP3 code data read from a USB device inside a car equipped  
20 with a car audio-stereo system but without any MP3 playing function. The MP3 application device comprises a host interface module, a playing module and a frequency modulation transmitter. Furthermore, the car audio-stereo system comprises a frequency modulation receiver.

[0012] According to the preferred embodiment of this invention, the host interface module further comprises a USB host circuit and a card host circuit. The USB host circuit is an interface for communicating with the USB device. The card host circuit is an interface for communicating with the memory card when the memory card is plugged into the MP3 application device.

[0013] According to one preferred embodiment of this invention, the playing module actively issues the fetch instruction via the host interface module and then reads MP3 code data from the USB device. The playing module comprises an MP3 decoder, a buffer unit and a host unit. The buffer unit is a place for holding the MP3 code data temporarily. The MP3 decoder converts the MP3 code data within the buffer unit into voice data and then outputs the voice data. The host unit is a controller for controlling the host interface module, the buffer unit and the MP3 decoder.

[0014] According to the preferred embodiment of this invention, the frequency modulation transmitter converts the voice data from the MP3 decoder into wireless signals and then transmits the wireless signals.

[0015] According to the preferred embodiment of this invention, the voice data is played when the frequency modulation receiver of a car audio-stereo system receives the wireless signals.

[0016] According to one preferred embodiment of this invention, the MP3 application device further comprises a voltage transformer for supplying power to various circuits within the MP3.

[0017] In this invention, a USB host terminal or a card host terminal is set up in the loudspeaker. Hence, MP3 audio data stored inside a portable disk or a memory card can

be directly read and played via the application device instead of being relayed through a computer.

[0018] It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0020] **FIG. 1** is a block diagram showing the circuit components of an MP3 application device according to one preferred embodiment of this invention.

[0021] **FIG. 2** is a block diagram showing the circuit components of an alternative MP3 application device according to one preferred embodiment of this invention.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0023] **FIG. 1** is a block diagram showing the circuit components of an MP3 application device according to one preferred embodiment of this invention. In this embodiment, a

Universal Serial Bus (USB) device **130** or a memory card **140** can be plugged into the MP3 application device **100**. The USB device **130** can be a portable disk, for example. The memory card **140** can be a data storage card including, for example, a Compact Flash (CF) card, a Smart Media (SM) card, a Secure Digital (SD) card, a Memory Stick (MS) or a  
 5 Multi-Media Card (MMC).

[0024] As shown in **FIG. 1**, the MP3 application device **100** comprises a host interface module **110**, a playing module **120** and a loudspeaker **150**. The playing module **120** is coupled to the host interface module **110** and the loudspeaker **150**. The host interface module **110** serves as an interface for communicating with a USB device **130** or a memory  
 10 card **140**. The playing module **120** issues a fetch instruction via the host interface module **110** to read MP3 code data from the USB device **130** or the memory card **140**. After decoding the MP3 code data, voice data is output to the loudspeaker **150**.

[0025] In this embodiment, the host interface module **110** further comprises a Universal Serial Bus (USB) host circuit **112** and a card host circuit **114**. The USB host circuit **112**  
 15 serves as an interface between the MP3 application device **100** and the USB device **130**. Similarly, the card host circuit **114** serves as an interface between the MP3 application device **100** and the memory card **140**.

[0026] The playing module **120** further comprises a host control unit **122**, a buffer unit **124** and an MP3 decoder **126**. The buffer unit **124** is coupled to the host interface module  
 20 **110**, the host control unit **122** and the MP3 decoder **126**. The host control unit **122** controls the host interface module **110**, the buffer unit **124** and the MP3 decoder **126**. The buffer unit **124** is a place for holding the MP3 code data read out from the USB device **130** or the memory card **140** temporarily. The MP3 decoder **126** converts the MP3 code data

within the buffer unit **124** into voice data and transmits the voice data to the loudspeaker **150** for broadcasting.

[0027] In this embodiment, the MP3 application device **100** is activated when the host control unit **122** actively issues a fetch instruction via the host interface module **110**.

5    Thereafter, MP3 code data is read from the USB device **130** or the memory card **140** and relayed to the buffer unit **124** for temporary storage via the host interface module **110**. The MP3 decoder **126** decodes the MP3 code data to produce voice data. Finally, the voice data is transmitted to the loudspeaker **150** for broadcasting.

[0028] **FIG. 2** is a block diagram showing the circuit components of an alternative MP3 application device according to one preferred embodiment of this invention. In this  
10    embodiment, the MP3 application device **200** reads MP3 code data from a universal serial bus (USB) device **130** or a memory card **140** and plays through the frequency modulation (FM) receiver **282** of a car audio-stereo system. The MP3 application device may also receive power from the standard 12V DC power outlet inside each car.

15    [0029] The MP3 application device **200** further comprises a host interface module **110**, a playing module **120** and a frequency modulation (FM) transmitter **270**. The playing module **120** is coupled to the host interface module **110** and the frequency modulation transmitter **270**. The host interface module **110** serves as an interface for communication with the USB bus **130** or the memory card **140**. The playing module **120** issues a fetch  
20    instruction via the host interface module **110** to read MP3 code data from the USB device **130** or the memory card **140**. Thereafter, the MP3 code data is decoded to output voice data. The frequency modulation transmitter **270** converts the voice data into wireless signals and then transmits the wireless signals.

[0030] The main difference between the MP3 application device **100** in **FIG. 1** and the MP3 application device **200** in **FIG. 2** is that the MP3 decoder **126** in **FIG. 2** transmits voice data to a frequency modulation transmitter **270**. After some processing treatment, the frequency modulation transmitter **270** transmits wireless signals containing voice data.

5 Other difference includes a voltage transformer **260** for receiving the DC power (12V) from the cigar lighter and converting the voltage to a suitable level for supplying power to various components inside the device **200**.

[0031] After transmitting the wireless signals carrying voice data is transmitted via the frequency modulation transmitter **270**, a frequency modulation receiver **282** within the car  
10 audio-stereo system picks up the signals. After some processing treatment, the voice data is broadcast inside the car.

[0032] In this embodiment, the MP3 application device **200** is activated when the host control unit **122** actively issues a fetch instruction via the host interface module **110**. Thereafter, MP3 code data is read from the USB device **130** or the memory card **140** and  
15 relayed to the buffer unit **124** for temporary storage via the host interface module **110**. The MP3 decoder **126** decodes the MP3 code data to produce voice data. The frequency modulation transmitter **270** converts the voice data into wireless signals and then the signals are transmitted. The frequency modulation receiver **282** receives the wireless signals and broadcast the voice data after some internal processing.

20 [0033] In this embodiment, the voltage transformer **260** can be a dc/dc voltage transformer, for example. Furthermore, if the MP3 application device **200** incorporates a large storage capacity device (not shown), the device **200** can read a large volume of MP3



code data from the USB device **130** or the memory card **140**. Hence, the MP3 application device **200** may broadcast MP3 code data directly from the large storage capacity device.

[0034] In summary, major advantages of the MP3 application device according to this invention includes:

5           1. MP3 audio data stored inside a portable disk or a memory card can be played directly without being relayed through a computer.

          2. The frequency modulation receiver inside a car can be used to play MP3 audio data stored in a portable disk or a memory card.

[0035] It will be apparent to those skilled in the art that various modifications and  
10 variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.